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EGYPTIAN WEIGHTS AND BALANCES

So far as evidence has yet been found, the balance was used for weighing in Egypt as early as the beginning of the I dynasty (3400 B.C.); for weights of this date have been found by Prof. Flinders Petrie at Abydos.[1] The first inscribed weight is one of Khufu, the builder of the Great Pyramid, of the IV dynasty.[2] The earliest representation of the balance itself belongs to the IV dynasty.[3]

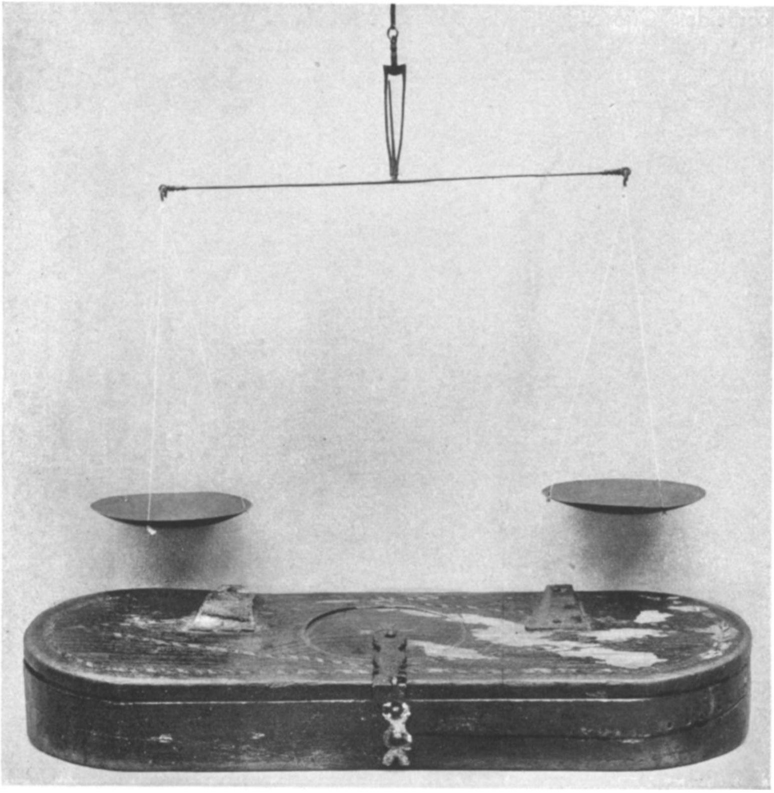

FIG. 1

Since coinage was not established in Egypt until the time of the Ptolemies, trade was a matter of exchange of commodities—for example, an ox for a certain weight of metal—and in such a transaction the balance was indispensable. It was used as an every-day convenience in industry, barter, and commerce, as representations on reliefs and papyri show, and is also represented in judgment scenes in the hereafter for weighing the human heart against the goddess of truth or her symbol, the feather.[4]

There are two kinds of balances, the one made to hold in the hand,[5] the other with a support of its own.[6] This museum possesses a small hand-balance of bronze dating from the Coptic period (fig. 1).[7] It consists of a cylindrical beam and needle made of one piece of metal, a handle shaped like a pair of tongs, and two pans. The needle projects from the top of the beam exactly in the middle, making the two arms equal. The two prongs of the handle are fastened by a pin to either side of the needle above the beam. The beam oscillates on this pin, which serves as a pivot, and the scales are evenly balanced when the needle and handle exactly coincide. The ends of the beam and the top of the handle are beaded and there are rings for suspension in all three places. The two pans of thin sheets of bronze, each in the shape of a watch glass, pierced on the edges with three holes for suspension, originally hung from the ends of the beam, as shown in the photograph; but the ancient cord is missing. This balance was kept in an inlaid wooden box, partitioned inside to keep the scales in place, with a compartment at one end, probably for weights. Such a weighing machine, though sensitive, was simple and practical for weighing small objects. It is occasionally pictured in drawings of the zodiac[1] or as actually in use,[2] but it does not occur in judgment scenes.

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[1] See Proceedings of the Society of Biblical Archaeology, vol. XXIII (1901), p. 385, nos. 7043 and 7046.

[2] See P.S.B.A., vol. XIV (1891-2), p. 442, no. 1.

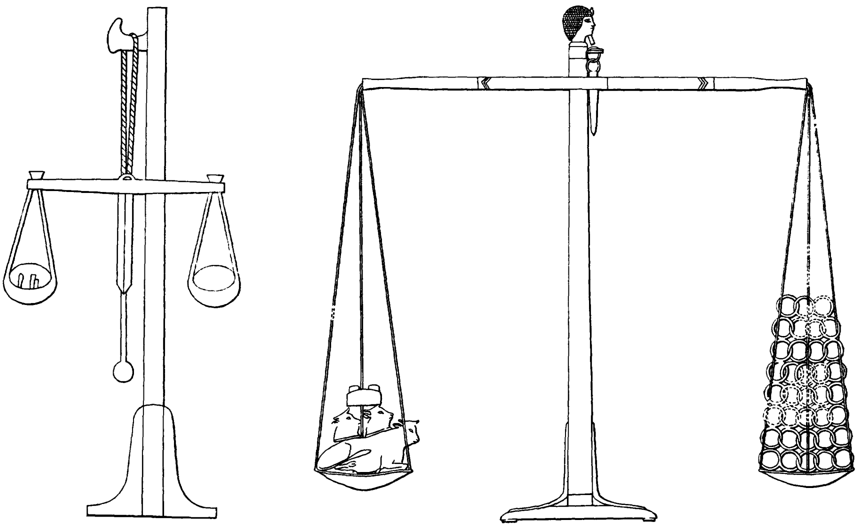
[3] Lepsius, Denkmäler II, 13.

[4] L.D. III, 232.

[5] Ducros, Deuxième Étude in Annales du Service des Antiquités de l'Egypte, X (1909), p. 240.

[6] Ducros, Étude sur les balances égyptiennes in Annales IX (1908), p. 32.

[7] Accession No. 14.2.2. L. of beam, $6\frac{1}{16}$ in.; L of handle, $1\frac{7}{8}$ in.; Diam. of pans, $2\frac{1}{8}$ in.



A FIG. 2 B

An inscription which speaks of a man's word as "accurate like a pair of balances" may refer to the balance with an upright support, for this was most used and probably obtained a greater degree of accuracy. Such a balance was sometimes as much as ten feet high.[3] No example of this type, complete in all its parts, is known to exist. However, the authorities of the Cairo Museum, having the ancient support, beam, and pans, have found it possible to reconstruct this form of balance from representations upon reliefs and papyri.[4]

The essential parts of the balance with a support are a post, with a projection at the top from which both the beam and a plumb bob are suspended, a needle attached to the under side of the beam, and two pans hung from either end of it (fig. 2A).[5] The post, of metal or wood, is fastened firmly in a base and is often ornamented at the top with a human head (fig. 2B),[6] or with figures of the gods Anubis, Horus, or Thoth, the god of writing and measures—a very appropriate adornment for the balance. The beam, of metal or wood, is either round or rectangular in section. It is pierced ex-

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[1] See Budge, The Gods of the Egyptians, vol. II, p. 315, 7.

[2] Relief from Sakkara in Cairo Museum, No. 58, pictured in Annales, X, p. 245, fig. 51.

[3] Breasted, History, p. 277.

[4] See Annales, IX, Pls. I and II and p. 38 ff.

[5] See Rosellini: I Monumenti dell' Egitto e della Nubia II, Pl. III, 1.

[6] From Naville, Deir el Bahri, III, Pl. LXXXI.

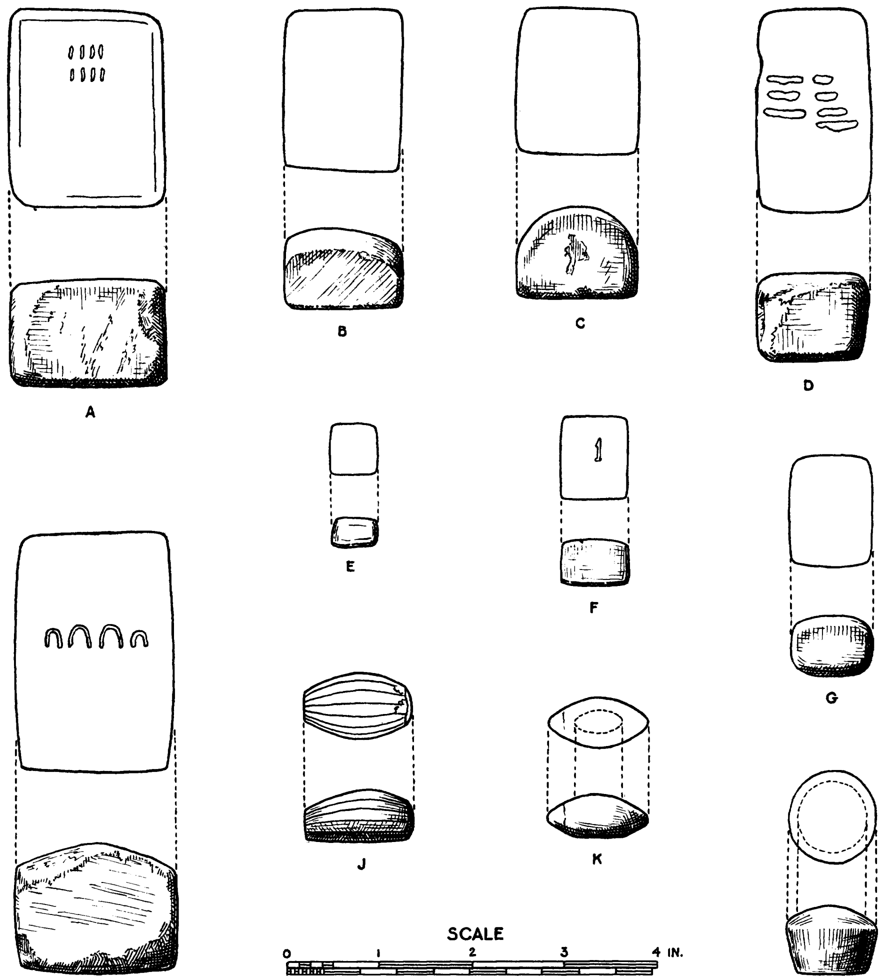

FIG. 3

MATERIAL[1]	WEIGHT	DENOMINATION
A Granite	166 +grams	8 Double Kidets
B Calcite	65 + "	5 Debens
C Diorite	77.5+ "	5 Debens
D Diabase	99 + "	7 Debens
E Granite	3.5+ "	¼ Deben

MATERIAL[1]	WEIGHT	DENOMINATION
F Yellow limestone	11.5 grams	1 Deben
G Basalt	35.5 "	4 Kidets
H Gray limestone	300.5+ "	40 Kidets
J Oxide of iron	16 "	2 Kidets
K Basalt	10 "	1 Kidet
L Diabase	19 "	2 Kidets

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[1] Identified through the kindness of Dr. Chester A. Reeds of the American Museum of Natural History.

actly in the middle of its length by a hole through which a cord or ring passes, and this loop, hung on a crotch or peg which projects from the upright, supports the beam in a horizontal position. From the same peg hangs a plumb bob, often shaped like a heart or sphere. A tongue, or needle, in the center of the under side of the beam indicates any inclination of the beam by comparison with the plumb line. The receptacles suspended from either end of the beam vary in shape from shallow plates to deep baskets or bags. These may have hung from hooks or from cords passed over the ends of the beam, but most frequently were suspended by cords which passed through holes piercing the beam longitudinally. Sometimes these holes extend only through part of the length of the beam and in this case cords are brought out through holes on the top of the beam and knotted. There must have been three or four such cords to support a dish properly, in spite of the fact that the artist was usually satisfied to draw only two—those falling in the same plane. It is interesting to find the different parts of the balance, namely, the post, beam, block, and weights, enumerated in the Harris Papyrus as being brought to the temple as offerings. These temple balances were of unusual richness, as the following quotation shows: "I made for thee splendid balances of electrum. . . . Thoth sat upon it as guardian of the balances, being a great and august ape . . . of gold in beaten work."[1] An inscription describing the construction of the temple balance of Re at Heliopolis says, "Nearly two hundred and twelve pounds of gold and four hundred and sixty-one pounds of silver were consumed."[2]

The balance was occasionally employed in Egypt to weigh two sets of objects against each other.[3] Manufacturers of vases used it in order to produce articles of fixed weight, a counterpoise being hung from one end of the beam to balance a vase hung from the other.[4] Many scenes show the weighing of all kinds of agricultural products, minerals—as silver, electrum, gold in rings (fig. 2B), or gold dust in bags—and precious stones quarried in Egyptian mines, used in trade or brought as tribute by foreigners. In these scenes when one or two men are doing the weighing, another is usually seen, pen in hand, recording the weight.

Since the price paid for a thing was settled by weight, the balance appears in scenes of barter with objects balanced against weights. Weights of two denominations mentioned in inscriptions—namely, the deben and the kidet—have been identified with the actual objects. The deben weighed from 13 grams in the Old Kingdom to 15.9 grams in the Empire. The kidet, first introduced in the Empire, varied in weight from 8.8 grams to 10 grams.[5] This variation, surprisingly wide, depends upon three things: the impossibility of accurately accounting for the loss in weight caused by breakage, or the gain, in the case of metals, caused by the accretion of oxides; a difference that might be expected in different localities in Egypt at the same time or at different dates; or a fraudulent tendency toward light weights which is also evident in coins of a later date.

Besides the deben and the kidet there were many other weights, fractions or multiples of these, but we do not know their names and will not until more inscribed weights have been found; and, so far, no regular system of division or multiplication has been worked out. A double unit—a two deben or two kidet unit—is common, and is found also in Assyria and in Greece, where the heavy weight, as it was called, contained two light weights.

The material of these weights was stone, such as diorite, basalt, alabaster, and limestone, and, from the Empire on, frequently bronze and hematite. In form they were rectangular, round, domed, conical, or semi-cylindrical. Some of the ordinary shapes in the collection in this museum are shown in figure 3, with their descriptions and probable denominations. We have six domed weights, like L in figure 3, which show an interesting gradation in weight, namely, 5, 4, 2, ½, ¼, ⅛ kidets, and they may have formed a set.

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[1] Breasted, Ancient Records, IV, 256.

[2] Breasted, History, p. 277.

[3] Griffith, Beni Hasan, IV, Pls. XI and XXVII.

[4] Petrie, Deshasheh, Pl. XIII.

[5] Weigall, Weights and Balances in Catalog Général, Introduction, pp. 3-12. See also Griffith, Notes on Egyptian Weights and Measures in P.S.B.A., vol. XIV, p. 435; vol. XV, p. 306; and Weigall, Some Egyptian Weights in Prof. Petrie's Collection in P.S.B.A., vol. XXIII, p. 378.

The finest weight in the collection (fig. 5)[1] was found in the excavations of the Museum's Egyptian Expedition at the North Pyramid at Lisht in the season of 1913-14. It is of polished porphyry, and bears on one side an inscription reading "Senusert, given life eternally, 70 gold debens." It weighs 954 grams, and, since little weight has been lost by chipping, this is a 70 deben weight having a unit of approximately 13.6 grams. This was used for weighing gold. Another weight in the collection (fig. 6),[2] bearing the name Iakhhotep, and because of this name probably Old Kingdom, is marked "8 debens." It is oblong, of basalt, and weighs 126 grams, a small piece being broken off at the back.

Besides these geometric forms, weights were sometimes made in the shape of animals. Representations on tomb walls show them shaped like a bull,[3] calf,[4] ibex,[5] or hippopotamus.[4] Figure 2B represents the weighing of rings of gold[6] against deben weights which are in the form of cows. Such actual weights are rare, but the Metropolitan Museum has two made of bronze. One, a recumbent calf (fig. 7)[7] is loaded with lead, which was poured in through a hole in one side to bring it to the required weight. There is a slight break on the bottom, some of the lead being lost, but it now weighs 84 grams. Probably it was a 6 deben weight with a unit of about 14 grams. The other bronze weight represents a bull's head (fig. 4)[8] and like the preceding one is loaded with lead. It weighs 17.6 grams and is a 2 kidet weight

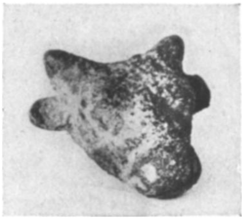

FIG. 4

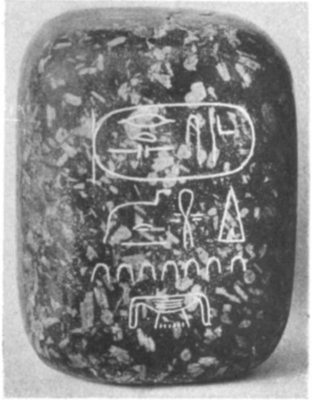

FIG. 5

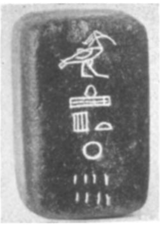

FIG. 6

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[1] Accession No. 15.3.233. See BULLETIN, vol. IX (1914), fig. 9 and p. 220. 3¾ in. x 2⅝ in. x 2⅜ in.

[2] Accession No. 14.2.3. 2 in. x 1¼ in. x $1\frac{3}{16}$ in.

[3] L.D. III, 39.

[4] Petrie, Qurneh, Pl. XXXV.

[5] Rosellini, *op. cit.*, II, Pl. LI.

[6] Such metal rings of a standard weight were in circulation and these are the nearest approach to money known in Dynastic Egypt. If they had been in common use, however, it seems probable that more of them would have been found in excavations.

[7] Accession No. 04.2.23. Length, $2\frac{7}{16}$ in.

[8] Lent by Theodore M. Davis, No. L 1372.633. Length of head, 1 in.

with a unit of 8.8 grams. Both of these weights probably belong to the Empire. This museum has also a glass weight shaped like the bulls' heads in figure 2B, although the nose is broken off. It was found in 1911 by the Museum's Expedition at the Palace of Amenhotep III at Thebes, and it dates from the XVIII dynasty.[1] Owing to its broken condition, however, neither its weight nor its denomination can be determined.

B. M. C.

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[1] Cf. a similar weight of bronze: Petrie, Tell el Amarna, Pl. XIII, 6.

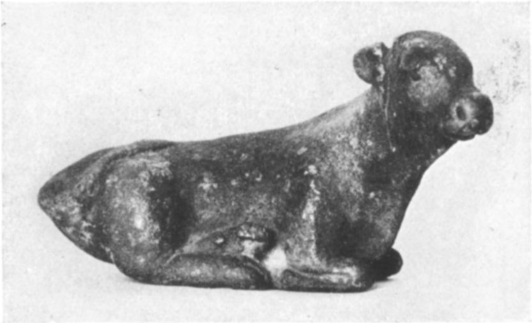

FIG. 7